

ETHYLENE GLYCOL

Ethylene glycol is a federal hazardous air pollutant and was identified as a toxic air contaminant in April 1993 under AB 2728.

CAS Registry Number: 107-21-1

HOCH₂CH₂OH

Molecular Formula: C₂H₆O₂

Ethylene glycol is a colorless, odorless, sweet-tasting, viscous liquid that is hygroscopic. It is miscible with water, lower aliphatic alcohols, glycerol, acetic acid, acetone and similar ketones, aldehydes, pyridine, and similar coal tar bases. Ethylene glycol is slightly soluble in ether and practically insoluble in benzene and its homologs, chlorinated hydrocarbons, petroleum ether, and oils (Merck, 1989).

Physical Properties of Ethylene Glycol

Synonyms: 1,2-ethanediol; glycol alcohol; glycol; E.G.; ethylene alcohol; 1,2-dihydroxyethane; monoethylene glycol; 2-hydroxyethanol; ethylene dihydrate

Molecular Weight:	62.07
Boiling Point:	197.6 °C
Melting Point:	-13.0 °C
Flash Point:	115 °C (closed cup)
Vapor Density:	2.14 (air = 1)
Density/Specific Gravity:	1.1135 at 20 °C (water = 1)
Vapor Pressure:	0.06 mm Hg at 20 °C
Log Octanol/Water Partition Coefficient:	-1.36
Conversion Factor:	1 ppm = 2.54 mg/m ³

(HSDB, 1991; Merck, 1989; U.S. EPA, 1994a)

SOURCES AND EMISSIONS

A. Sources

Ethylene glycol is used as an antifreeze, as a heat transfer agent, in polyester fiber and film manufacture, as a deicer, and as a solvent (HSDB, 1991).

The primary stationary sources that have reported emissions of ethylene glycol in California

are commercial printing businesses, manufacturers of wood buildings and mobile homes, and funeral and crematorium services (ARB, 1997b).

Ethylene glycol was registered for use as a pesticide; however as of December 31, 1990, it is no longer registered for pesticidal use in California (DPR, 1997).

B. Emissions

The total emissions of ethylene glycol from stationary sources in California are estimated to be at least 37,000 pounds per year, based on data reported under the Air Toxics “Hot Spots” Program (AB 2588) (ARB 1997b).

C. Natural Occurrence

No information about the natural occurrence of ethylene glycol was found in the readily-available literature.

AMBIENT CONCENTRATIONS

No Air Resources Board data exist for ambient measurements of ethylene glycol.

INDOOR SOURCES AND CONCENTRATIONS

No information about the indoor sources and concentrations of ethylene glycol was found in the readily-available literature.

ATMOSPHERIC PERSISTENCE

Ethylene glycol exists in the atmosphere in the gas phase. The dominant atmospheric loss process for ethylene glycol is by reaction with the OH radical. Based on this reaction, the atmospheric half-life and lifetime of ethylene glycol is estimated to be 1.3 days and 1.9 days, respectively (Atkinson, 1989). The major product of this reaction is expected to be hydroxyacetaldehyde (Atkinson, 1995).

AB 2588 RISK ASSESSMENT INFORMATION

For non-cancer health effects, ethylene glycol contributed to the total hazard index in 1 of the approximately 89 risk assessments reporting a total chronic hazard index greater than 1 (OEHHA, 1996b).

HEALTH EFFECTS

Possible routes of human exposure to ethylene glycol are inhalation, ingestion, and dermal contact.

Non-Cancer: Ethylene glycol is a central nervous system depressant in humans. It is metabolized to oxalic and other acids and may cause acidosis. Following ingestion of large quantities, acute symptoms include vomiting, drowsiness, coma, respiratory failure, and convulsions. Cardiopulmonary effects and renal injury may occur subsequently. No adverse effects were noted in one study of individuals chronically exposed by inhalation to low levels of ethylene glycol for approximately one month. However, short-term exposure of humans to high levels of ethylene glycol aerosol produced irritation (Wills et al., 1974). Rats, rabbits, and guinea pigs, subchronically exposed to ethylene glycol by inhalation developed ocular irritation and lesions and pulmonary inflammation (U.S. EPA, 1994a).

The United States Environmental Protection Agency (U.S. EPA) has not established a Reference Concentration (RfC) for ethylene glycol, but has set an oral Reference Dose (RfD) of 2.0 milligrams per kilogram per day based on kidney toxicity in rats. The U.S. EPA estimates that consumption of this dose or less, over a lifetime, would not likely result in the occurrence of chronic non-cancer effects (U.S. EPA, 1994a).

No information is available on adverse reproductive or developmental effects of ethylene glycol in humans. Rodents in several studies, exposed by gavage or inhalation, exhibited adverse effects on fetuses that included increased preimplantation loss, delayed ossification, and an increased incidence of fetal malformations (U.S. EPA, 1994a).

Cancer: No information is available on the carcinogenic effects of ethylene glycol in humans. The U.S. EPA has classified ethylene glycol in Group D: Not classifiable as to human carcinogenicity (U.S. EPA, 1994a). The International Agency for Research on Cancer has not classified ethylene glycol as to its human carcinogenicity (IARC, 1987a).

